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Abstract

Virtual teams, enabled by information technology, represent a new organizational form that has the potential to change the workplace and provide organizations with increased levels of flexibility and responsiveness.

A gap exists in the current information systems literature. Previous studies seem to implicitly assume that virtual teams will be self-directed—i.e., that managerial control mechanisms are not required in this setting. This study makes this assumption explicit and tests it.

Propositions are developed and tested based on an extension of team effectiveness research in a colocated environment. The contribution of managerial behavior control practices to virtual team effectiveness is also evaluated by juxtaposing self-directed teams with virtual teams where managerial behavior control is enforced.

1. INTRODUCTION

Continuing developments of information technologies (IT) have led, particularly in recent years, to the development of new organizational forms that are flexible and responsive (Fulk and DeSanctis 1995; Jarvenpaa and Ives 1994). The *virtual team* represents a fundamental component of these new organizational forms (Jarvenpaa and Ives 1994).

Virtual teams are defined here as groups of geographically and organizationally dispersed knowledge workers brought together across time and space through information and communication technologies on an "as needed basis" in response to specific customer needs or to complete unique projects (DeSanctis and Poole 1997; Jarvenpaa and Leidner 1998; Lipnack and Stamps 1998).

Technological support for virtual teams and collaboration in distributed environments is now readily available (Constant et al. 1996). However, virtual team use presents risks if organizations fail to anticipate the challenges of this new environment (DeSanctis and Poole 1997; Handy 1995; Victor and Stephens 1994). Primarily, organizations must be able to effectively use IT to rapidly mesh the individual skills of strangers—or near strangers—into interdependent work products (Iacono and Weisband 1997).

How can organizations foster virtual teams' success? What structural arrangements contribute to the highest levels of team effectiveness? While the management literature has traditionally investigated work groups and teams, information systems (IS)

researchers, with their understanding of both the managerial challenges and the rapidly evolving IT-based support platforms, are well positioned to address questions relative to virtual team effectiveness.

Empirical work in the IS area has concentrated on the development and maintenance of trust (Iacono and Weisband 1997; Jarvenpaa et al. 1998; Jarvenpaa and Leidner 1998), individual learning (Alavi and Yoo 1997; Knoll and Jarvenpaa 1995), emergent leadership (Yoo and Alavi 1997), team leadership (Kayworth et al. 2000), team performance, individuals' satisfaction, and team cohesiveness (Chindambaram 1996; Gelegher and Kraut 1994).

While the range of issues studied is broad, all of this research has focused on self-directed virtual teams,[1] with the exception of very recent work (Kayworth et al. 2000). It appears that extant IS research has been implicitly based on the assumption that virtual teams will be able to optimally organize their work-flow and manage internal processes. The potential impact of traditional managerial control mechanisms[2] on team effectiveness has been ignored. Control mechanisms have been largely found beneficial in traditional colocated teams. An extension of this research tradition to the virtual context is, therefore, pursued in the present work.

Some argue that the transition to virtual teams "may result in decreased use of formalized rules and procedures as control mechanisms" (DeSanctis and Poole 1997, p. 168). However, it is arguable that greater levels of team self-direction may engender increased confusion, decreasing responsibility and introducing a lack of accountability that could have drastic repercussions at the team, organization, and societal levels (Handy 1995; Victor and Stephens 1994). Indeed, DeSanctis and Poole recognize that the lack of formal procedures in virtual teams does not equate to lack of discipline but a reliance on more flexible arrangements.

It is important to determine whether increased levels of flexibility and discretion will enhance or hinder virtual team effectiveness. This study provides an empirical test of the proposition that greater autonomy benefits virtual teams while challenging the seemingly established view that self-direction and autonomy represent the optimal structural configuration for virtual teams. The study seeks to:

- Explore whether traditional managerial behavior control mechanisms enhance virtual team effectiveness (i.e., performance, individual psycho-social outcomes, and individual learning).

- Investigate the internal team processes that may foster virtual team effectiveness.

The paper develops and tests a model of virtual team effectiveness and makes contributions in two areas. From a theoretical perspective, it directs attention to a gap in the IS literature and provides an initial attempt to fill it. On the applied front, it provides important insight to those considering or actually implementing virtual teams.

2. RESEARCH OBJECTIVES

A cogent theory of the determinants of virtual team effectiveness has yet to be developed. However, other theoretical models, developed for traditional environments, may hold true for virtual teams. Among these are literatures on product development (for a review, see Brown and Eisenhardt 1995), managerial control (Henderson and Lee 1992; Kirsch 1997), and the determinants of project team effectiveness (Guinan et al. 1998; Pinto et al. 1993). Based on a review and extension of the literature, the following research questions will be addressed:

- Are virtual teams more effective when managerial behavior control is enforced rather than allowing the team to self-direct?

- What internal virtual team processes account for team effectiveness? In other words, what are the immediate determinants of virtual team effectiveness?

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[1]Self-directed teams are defined as "groups of interdependent individuals that can self-regulate their behavior on relatively whole tasks" (Cohen and Ledford 1994; Goodman et al. 1988). Most notably, self-directed teams retain control over organization of work. The team determines work assignment, work methods, and scheduling of activities.

[2]As discussed below, this study focuses on managerial behavior control. Examples of behavior control are periodic meetings, project plans, progress reports (Kirsch 1997), rules and procedures, and work assignment (Henderson and Lee 1992).

- How does managerial behavior control affect internal virtual team processes to promote or hinder increased virtual team effectiveness?

The first research question directly investigates whether managerial behavior control benefits virtual teams. This research objective is important in light of the preponderant attention that empirical IS research has devoted to self-directed virtual teams. The second question looks into the "black box" in order to discern what internal processes are distinctive for successful virtual teams. The third question combines knowledge from the previous two, so as to determine the role of managerial behavior control practices in fostering virtual team success.

3. THEORETICAL FRAMEWORK

Product development theories, developed in traditional colocated environments, explain how effective product development processes can emerge and be sustained (Brown and Eisenhardt 1995). Findings from the extensive product development literature "indicate that effective group processes, particularly those related to communication, increase information and so are essential for high-performing development processes" (Brown and Eisenhardt 1995, p. 368). These findings are echoed by others and clearly point to the central role of frequent and effective internal communication for team success (Allen 1977; Ancona and Caldwell 1992; Dougherty 1992; Ebadi and Utterback 1984). A high level of coordination among team members is also a mark of highly effective teams (Ancona and Caldwell 1992; Kraut and Streeter 1995; Pinto et al. 1993). Communication and coordination breakdowns are seen as a major hurdle faced by project teams (Curtis et al. 1988). Coordination problems arise in teams from the dependencies between members and they are often engendered by the structure of the problem, particularly in complex projects (Crowston and Kammerer 1998). Rules and procedures (i.e., behavior control) are often introduced to mitigate such coordination problems (Pinto et al. 1993).

The lack of face-to-face interaction in virtual teams may make obstacles to effective coordination and communication more salient and thus further impair team effectiveness (Jarvenpaa et al. 1998; Jarvenpaa and Leidner 1998). Research within the CMC tradition indicates that individuals who interact through information and communication technologies may be more self-absorbed (Sproull and Kiesler 1986), less attentive, and less receptive to contextual cues (Lea and Spears 1992; Sproull and Kiesler 1986). Interaction in CMC groups has also appeared to be impersonal, task-oriented, less friendly, and more business like (Connolly et al. 1990; Rice and Love 1987; Sproull and Kiesler 1986; for a review, see Bordia 1997). While some authors indicate that these findings are a function of slow communication interaction due to extensive typing needs in CMC (Walther 1992, 1995), there is compelling evidence that the virtual context dramatically increases communication needs and task uncertainty (Jarvenpaa et al. 1998; Jarvenpaa and Leidner 1998). It appears that successful virtual teams are the ones that engage in extensive and predictable communication patterns, display high task goal clarity, superior time management skills, and alertness to deadlines (Jarvenpaa et al. 1998; Jarvenpaa and Leidner 1998).

This previous work provides evidence that in virtual teams, internal coordination and communication are of paramount importance.[3] Thus,

Proposition 1: *Virtual teams that achieve higher levels of internal communication and coordination will be more effective.*

Modern control theories (Ouchi 1979; Thompson 1967) are concerned with "the mechanisms through which an organization can be managed so that it moves toward its objectives" (Ouchi 1979, p. 833). Ouchi introduced three types of control mechanisms:

- Output control stems from the ability to accurately quantify output (Kirsch 1997) and it can be implemented when the organization can rely on "objective" output measures.

- Behavior control derives from knowledge and observability of behaviors that leads to the desired outcome (Kirsch 1997). Behavior control is fruitful when the organization has knowledge of behaviors that will lead to goal achievement.

- Clan control refers to highly ritualized and ceremonial forms of control that are used when no "objective" forms of control can be implemented. The goal is to socialize individuals so that they internalize the values and objectives of the organization.

[3]It should be noted that we are not making a relative value judgment or implying that other factors (e.g., available technology, managerial feedback, etc.) are not important.

Clan control is based on selection and socialization of members (Kirsch 1997; Ouchi 1979). Virtual teams, as short lived groups of professionals assembled on an "as needed" basis across geographical and organizational boundaries, are not likely suited for the extensive socialization process that is the prerequisite of informal modes of control. It is conceivable that in the future, organizations that extensively rely on virtual teams will be able to socialize team members so that they internalize "cross-organizational virtual team member values." In such a scenario, clan control may be a viable, even powerful, control practice.

At present, formal control methods appear far more viable in the virtual context. One of the primary advantages offered by virtual teams is their flexibility. Organizations that employ them have the ability to group the most appropriate set of individuals required to complete a specific task (Jarvenpaa and Leidner 1998; Townsend et al. 1996). For this reason, virtual teams are normally assigned to atypical and highly specialized projects (Jarvenpaa and Ives 1994) involving unique information and changing requirements. Output control, in Ouchi's original formulation, is predicated on the ability to accurately measure output (i.e., quantity and quality) and presupposes knowledge of ordinary production outcomes. While outcome control may represent a viable alternative, particularly when virtual teams are assembled in response to unique customer requests, its applicability may be contingent on project characteristics. Research is needed to understand the range of applicability of outcome controls in virtual teams. Behavior control is the focus of this study.

Managerial behavior control seems well suited to the virtual environment. Moreover, this control method can be easily and broadly implemented across a wide range of virtual teams and projects. The major challenges to virtual team effectiveness stem from the lack of face-to-face interaction and the ensuing communication and coordination difficulties. Therefore, if behaviors that mitigate these problems and contribute to minimize process losses can be identified and enforced, effectiveness of a wide range of virtual teams should be ensured. Townsend et.al (1998) endorse behavior control as a method of managerial control in virtual teams: "the virtual team's rich communicative environment, along with the system's capacity for archiving data and communications, actually empowers considerably more managerial monitoring than it is possible in traditional environments" (p. 25). They further prescribe that "clear schedules must be established of when the team will provide reports, interim deliverables and final product" (p. 25).

Virtual teams, due to their limited life span and cross-functional or cross-organizational membership, may be unable to quickly reach the critical mass of communication and information sharing that is fundamental to the project team's success (Brown and Eisenhardt 1995; Keller 1986). Indeed, some scholars explicitly advocate periodic face-to-face meetings for teams involved in intensive communication tasks (e.g. project planning) to build and maintain interpersonal relationships (DeMeyer 1991; Gelegher and Kraut 1994).

It is plausible that virtual teams will experience reduced effectiveness due to lack of social context cues, difficulty in enforcing group norms, and generally increased ambiguity in the communication process. Behavioral controls that stimulate internal communication and enhance members' coordination may mitigate these problems. Thus,

Proposition 2: *Virtual teams where managerial behavior control is enforced will be more effective than self-directed virtual teams.*

Proposition 3: *Behavior control in virtual teams will stimulate higher levels of communication and coordination that will contribute to increase team effectiveness.*

4. RESEARCH METHODOLOGY

To test the research propositions we designed a field experiment employing a two group longitudinal design. A total of 51 virtual teams, consisting of four members drawn from six universities on three continents, were assembled. The study lasted eight weeks. During this time the teams completed three projects. During the first week, they completed a team building exercise. During the following two weeks, they completed a preliminary research exercise and produced a report. During the last five weeks, the subjects completed the main project: the development of a business plan. During these five weeks, the experimental manipulation was applied. A pre-test/post-test design with random assignment of subjects to teams and teams to treatments was employed.

While the realism and generalizability of an experiment using students may be questioned, an experiment affords us the highest level of control over confounding factors (McGrath 1982). Moreover, two of the potential limitations of this design, namely the use of zero-history groups and the limited duration of the experiment (George and Jessup 1997), are actually typical attributes of virtual teams.

The experimental manipulation consists of the enforcement of managerial behavior control as opposed to team self-direction. Half the teams were required to comply with a set of procedures under the direction of a project coordinator. Acting as a manager for the treatment groups, the coordinator required that they file a weekly progress report. In the progress report, the team had to discuss attainment of goals from the previous week, set specific goals for the coming week, and assign work to individual team members. This operational definition of behavior control was based on previous research (Henderson and Lee 1992; Kirsch 1997; Ouchi 1979).

Data was collected through online questionnaires. Further, a comprehensive log of all communication in the virtual teams was compiled. The logs were used as a source of objective quantitative data (i.e., number and type of messages) and qualitative data to better qualify the results and interpret any unanticipated findings. The qualitative data was analyzed following a technique employed in prior virtual team research (Jarvenpaa and Leidner 1998). The communication logs for each team were analyzed noting the name of the contributor, the date and time of the messages, and the content. An average 10 to 12 page case database was developed for each case. The essential evidence from the database was then condensed into three to four page case reports. Based on the evidence collected, hypotheses were generated and a critical test for these hypotheses was developed through theoretical replication (Yin 1989).

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